angustaque, ramis brevibus plus minusve 1 mm. Corollae rotatae, diametro circa mm. 2, flavae vel virides, extra sparse hispidae. Ovaria glabra. Fructus carnosi didymi vel saepe orbiculares, laeves.

Type. Seaward slope of Santa Lucia Mountains in grove of Sargent Cypress, south ultimate fork of Alder Creek, southwestern Monterey County, California, at 2200–2500 feet, *Clare Hardham 5650* (JEPS).

Other collections. Monterey County: upper reaches of Alder Creek, *Dempster & Hardham 1406* (JEPS); Villa Creek south of Lion Den Spring, *Hardham 6065*. San Luis Obispo County: Waterdog Creek, *Hardham 6380* (JEPS); Cypress Swamp just northeast of Cypress Mountain, *Hardham & Dempster 5703* (JEPS), *Hardham 3962* (JEPS); Spanish Cabin Creek, *Hardham 5963;* Tobacco Creek, *Hardham 5967;* headwaters of Chris Flood Creek (San Carpoforo), *Hardman 6145*. Numbers otherwise undesignated are in the private collection of Mrs. Hardham at Paso Robles, California.

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A NEW SPECIES OF CRYPTANTHA (SECTION CIRCUMSCISSAE) FROM CALIFORNIA AND TWO RECOMBINATIONS (SECTION CIRCUMSCISSAE AND SECTION ANGUSTIFOLIAE)[1]

Kunjamma Mathew and Peter H. Raven

Cryptantha circumscissa (H. & A.) I. Johnston is an annual herb that occurs over a wide area of western North America, from Wyoming and central Washington to Arizona and northern Baja California. In one population, supposed to be referable to this species and located north of Adelanto on the Mojave Desert of San Bernardino County, California, three distinct entities were found, differing modally from one another in corolla size. The largest-flowered group of plants had corollas 4–6 mm. in diameter and pollen grains 5.5–6.5 μ long. These measurements are beyond the range of variation characteristic of *C. circumscissa*. With further exploration it was found that plants with such measurements comprised a distinctive series of populations from a limited area in southern California, and they are described below as a new species.

Cryptantha similis Mathew & Raven, sp. nov. Herba annua sectionis *Circumscissae,* a *C. circumscissa* persimilie, at differt: corolla 4–6 mm. lato; granis pollinis 5.5–6.5 μ longo.

Slender or bushy, bristly-pubescent annual herb, cymosely branched from the base, with ascending branches to 10 cm. long; leaves linear to narrowly oblanceolate, 3–10 mm. long, inconspicuously pustulate, with

[1] Thanks are due Professor Harlan Lewis for pointing out the variation pattern leading to this study and for a critical review of this manuscript, and to the curators of the following herbaria for permission to examine material in their care: British Museum (Natural History), California Academy of Sciences, University of California (Berkeley), Dudley Herbarium (Stanford University), Pomona College, Rancho Santa Ana Botanic Garden, and Royal Botanic Gardens (Kew).

no apparent veins, well distributed but congested just below the short inflorescences; inflorescences to 1.5 cm. long, the flowers axillary and very crowded; corollas conspicuous, 4–6 mm. in diameter, white, yellowish at throat; pollen 5.5–6.5 μ long, oblong; fruiting calyx 2.5–4 mm. long, bristly pubescent, the sepals united to near the middle, with a circumscission just below the sinuses, the upper half falling away at maturity, the persistent portion cupulate; pedicels less than 0.5 mm. long; nutlets 4, homomorphous, lance-ovate, 1.2–1.5 mm. long; gynobase about two-thirds the height of the nutlets, slender-pyramidal; style equal to or barely exceeded by the nutlets. Gametic chromosome number, n=6.

Type. 8.7 miles north of Adelanto on United States Highway 395, San Bernardino County, California, *Lewis & Mathew 1113A* (RSA).

Additional specimens examined. California. Kern County: Red Rock Canyon, *Howell 4925* (with *C. circumscissa*); Mojave, *Lemmon in 1881* (with *C. circumscissa*); 12 miles southeast of Mojave, *Crum 1798*. San Bernardino County: Hesperia, *Spencer 387* (with *C. circumscissa*); north of Hinkley, *Anderson 6853*; near Victorville, *Jones in 1926* (with *C. circumscissa*), *Lee 8545, Wilson 31*; Randsburg road, *Weston 621*; 10 miles north of Adelanto, *Kirby 1116*; Barstow, *Munz 2544* (with *C. circumscissa*); between Hesperia and Adelanto, *Munz 4474*; 1.7 miles northeast of Helendale, *Raven 11951*; Swartout Canyon, *Hall 1537*; Swartout Valley, *Munz 4618*; Cajon Pass, *Johnston in 1920, Munz et al. 4672, Parish 11832*. Los Angeles County: above Littlerock, *Ray 931*; between Big Rock Creek and Little Rock Creek on State Highway 138, *Abrams 13946*; Arraster Creek, San Gabriel Mountains, *Peirson 1001*.

Cryptantha similis and *C. circumscissa* comprise the section *Circumscissae* I. Johnston (Contr. Gray Herb. 74:40. 1925). *Cryptantha similis* has both larger corollas and larger pollen grains, the corollas of *C. circumscissa* being only from 1–4 mm. in diameter and the pollen grains from 7–9 μ in length (these measurements based on an examination of more than 100 collections from throughout the range of *C. circumscissa* and including the type: Snake Country, "California," *Tolmie,* K).

The gametic chromosome number of *C. similis* is n=6, whereas that of *C. circumscissa* is usually n=12, although one plant of *C. circumscissa* from the locality north of Adelanto had n=18 (table 1). As already stated, three distinct morphological entities were found at the location north of Adelanto. One of these was the large-flowered *C. similis* just described. The remaining plants at this locality fell into two groups with respect to corolla size, both conforming, however, to the size limits given above for *C. circumscissa*. One of the plants of the smaller-flowered group was counted and was found to have a chromosome number of n=18 (hexaploid; table 1), whereas the plant which was counted from the group with medium-sized flowers had n=12 (tetraploid), the same chromosome number that was found in plants of *C. circumscissa* from other populations. The difference in pollen size between these two groups was not significant. The n=18 plant from north of Adelanto might have had an allohexaplaid origin, with tetraploid *C. circumscissa* (n=12) and diploid *C. similis* (n=6) as the probable parents. Some tetraploid plants of *C. circumscissa* that were examined from other localities, however, had

Table 1. Chromosome Numbers of Cryptantha Species*

C. circumscissa (H. & A.) I. Johnston subsp. *circumscissa*
n=12. Nevada. Washoe County: 6.1 miles north-east of Sparks, *Raven 14287*. Esmeralda County: Lida Pass, *Raven 15476*.
California. Mono County: Sherwin Grade, *Raven 14295, 14296*; Paradise Camp, *Raven 14262*. Inyo County: Bishop Creek, *Raven 14302, 14303*. Kern County: Walker Pass, *Raven 13992*. San Bernardino County: Lenwood, *Raven 13902*; 8.7 miles north of Adelanto, *Lewis & Mathew 1113B*.
n=18. California. San Bernardino County: 8.7 miles north of Adelanto, *Lewis & Mathew 1113C*.
C. micrantha (Torr.) I. Johnston subsp. *lepida* (Gray) Mathew & Raven
n=12. California. Riverside County: San Jacinto Mountains, *Raven 14241*.
C. micrantha subsp. *micrantha*
n=12. California. San Diego County: Borrego Valley, *Raven 14847*.
C. similis Mathew & Raven
n=6. California. San Bernardino County: 8.7 miles north of Adelanto, *Lewis & Mathew 1113A*.

* Vouchers deposited at Rancho Santa Ana Botanic Garden, Claremont, California.

corollas as small as those of the Adelanto hexaploid. For example, at two California localities outside the range of *C. similis* (Sherwin Creek, Mono County; Bishop Creek, Inyo County), two groups of plants were found growing together that corresponded in corolla size with the tetraploid and the hexaploid (n=18) from north of Adelanto. In both of these latter cases, however, all plants examined were tetraploid (n=12). Thus there appears to be no basis for the taxonomic segregation of the hexaploid. As for the difference in corolla size between the diploid and tetraploid, it is possible that the diploid may be allogamous to a greater extent than is the teraploid, and thus follow the sort of correlation between polyploidy and autogamy discussed in some detail by Grant (Am. Nat. 90:319–322. 1956). Although the chromosomes are small and difficult to observe, there is no suggestion of multivalent formation in the tetraploid, and hence it may have had an alloploid origin. *Cryptantha similis,* however, appears to be the only diploid closely enough related to *C. circumscissa* to have participated in its origin.

In view of these results, it is pertinent to discuss the patterns of morphological variation of *C. circumscissa.* In the southern Sierra Nevada of California at high elevations there occurs a distinctive geographical entity, *Cryptantha circumscissa* subsp. **rosulata** Mathew & Raven, comb. nov. (*C. circumscissa* var. *rosulata* J. T. Howell, Leafl. West. Bot. 6:104. 1951). Based on measurements of its pollen, *C. circumscissa* subsp. *rosulata* is probably tetraploid like subsp. *circumscissa.* Another variant involves hispid plants from the eastern slopes of the Sierra Nevada which have been separated as *Krynitzkia dichotoma* Greene or as *Cryptantha circumscissa* var. *hispida* (Macbride) I. Johnston (Contr. Gray Herb. 74:1–114. 1925), but inasmuch as they occur intermingled with plants

typical of subsp. *circumscissa* in this area and less commonly elsewhere and do not appear to be sharply distinct morphologically, we prefer not to recognize them taxonomically. These patterns of variability in *C. circumscissa* are apparently analogous with that concerned with corolla size, which has already been discussed, and, like it, they are doubtless reinforced by autogamy.

Since the detection of *Cryptantha similis* became possible following the determination of its chromosome number, we also investigated an apparently analogous pair of taxa in the related section *Angustifoliae, Cryptantha micrantha* (Torr.) I. Johnston subsp. *micrantha,* with very small flowers, and another entity with larger flowers, *Cryptantha micrantha* subsp. **lepida** Mathew & Raven, comb. nov. (*Eritrichium micrantha* var. *lepidum* Gray, Syn. Fl. 2:193. 1878). In this case, however, both taxa were found to have the same gametic chromosome number, n = 12 (table 1). It should also be noted that the large- and small-flowered taxa have not been found growing together. They appear to be largely geographical entities best recognized as subspecies.

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REVIEW

Taxonomy of Flowering Plants. By C. L. Porter. viii + 452 pp., W. H. Freeman San Francisco. 1959. $6.75.

"Taxonomy of Flowering Plants" is one in the series of high-quality biology texts published by Freeman and Company. Dr. Porter states that he hopes it will help to fill the gap he sees existing between "texts that are really reference books for advanced students and much abbreviated texts that have had much of the meat of the subject deleted from them." This rather effective compromise is a work of some 450 pages, suitable for introductory courses of either one or two semester's length. It is divided into three principal parts: History, Principles, and Methods; Selected Orders and Families of Monocotyledons; and Selected Orders and Families of Dicotyledons. A 16-page glossary precedes the Index.

Part I, History, Principles, and Methods, is rather abbreviated. It should be entirely satisfactory for many introductory courses, but will require some supplementation in courses where a substantial portion of the students requires more detailed information. An exposition of aims, history, literature, field and herbarium methods, nomenclature, concepts of taxa, construction and use of keys, phytography and terminology, and phylogeny and classification of angiosperms which can be encompassed within 140 pages and yet prove entirely satisfactory for a wide variety of taxonomy courses is probably impossible. Dr. Porter intended to produce a concise treatment, and he is no doubt aware that some will find his work excessively synoptic in places. The reviewer believes that the material on field methods and the chapter entitled "Concepts of Taxa" are cases in point. In addition, instructors who stress nomenclature will find his chapter of the same name very brief indeed. However, the author generally has been remarkably successful within his self-imposed space limitations. The chapter on phytography and terminology is a good one. It is four times as long as the average chapter in this section, and replete with illustrations.